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REPORT

ON THE

NATIONAL SCHOOLS OF SCIENCE.

BY

PROFESSOR D. C. GILMAN.

OF THE

SHEFFIELD SCIENTIFIC SCHOOL OF YALE COLLEGE,

NEW HAVEN, CONNECTICUT.

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REPORT ON THE NATIONAL SCHOOLS OF SCIENCE.

SHEFFIELD SCIENTIFIC SCHOOL OF YALE COLLEGE,
NEW HAVEN, CONNECTICUT, *November* 1, 1871.

SIR: It is now about three months since you entrusted me with a commission to investigate and report upon the condition of the various scientific and agricultural schools which have been established in the Northern States, east of the Rocky Mountains, in accordance with an act of Congress approved July 2, 1862, and commonly, though erroneously, called "the Agricultural College bill."

The interval which has passed since your wishes were made known has been insufficient for a thorough survey of even this restricted field. During a considerable portion of the time the various institutions were in the midst of their summer vacations, and since the period of instruction began I have been occupied even more closely than I expected by college duties in New Haven.

I have been able, however, during the last few months to visit the colleges which are aided by the national grant in Massachusetts, New Hampshire, Connecticut, New York, New Jersey, Michigan, Wisconsin, and Minnesota, and to have prolonged conversation with one or more of the principal officers in these institutions, and in those of Illinois, Iowa, Kansas, Kentucky, Pennsylvania, Tennessee, Missouri, and Mississippi. With those of some of the other States I have been in correspondence.

But the more I consider the subject the more important does it appear to postpone for a year a detailed report upon these institutions. In 1872 ten years will have gone by since the act of Congress was passed under which the national colleges have been organized, and this expiration of the first decade seems to me a fit time for a review of the work accomplished. It constitutes the period of State legislation and preliminary inquiry.

Probably, as each successive decennium rolls by, it will be found that a like report will be called for by the Government and the people. Whether this duty is intrusted to me or to some one else for the coming year, I would respectfully recommend that the inquiry be as complete and thorough as possible, and that it be conducted in the spirit of a sincere desire to discover what is good, and likewise what is deficient, in these institutions, so that the good may be strengthened and copied, and the failures, if such there be, may be so distinctly pointed out that they shall not be repeated.

Such an investigation should, of course, extend to the States of the whole Union, and not to those of the North and East alone. It would also be highly desirable that notice should be simultaneously taken of such scientific schools as are not aided by the national grant; like the Lawrence School at Cambridge, the Rensselaer School at Troy, the Stevens Institute at Hoboken, and others in like manner endowed by private munificence.

As an indication of the scope of such inquiries, I would present the following schedule, which is designed to be suggestive rather than exhaustive:

TABLE I.—*Schedule of inquiries respecting the national schools of science.*

(To be answered in 1872.)

I. *State action.*—A full exhibition of the legislation of the State bearing upon the national grant.

II. *Financial results of the grant.*—What price did the scrip sell for? What aggregate fund has it made? What annual income does it afford? By whom is the fund held? How is it invested?

III. *Other funds.*—Whence derived? Of what amount? How restricted? What annual income?

IV. *Tuition.*—How much is charged? How much in the aggregate was received last year? How many free scholarships, and how are they bestowed?

V. *Buildings.*—A particular statement of the number, dimensions, cost, uses, &c.

VI. *Lands held for college purposes.*—Amount, cost, purpose to which devoted.

VII. *Farm.*—What experience in respect to its educational utility, economy, service in experimental work, &c.

VIII. *Courses of study.*—The published schemes. How far are they actually established and attended by students? Qualifications for admission and for graduation. What views are held in respect to the proportion of technical or professional studies, and of general or disciplinary studies; comparative estimate of lectures, recitations, and laboratory exercises?

IX. *Trustees.*—How constituted?

X. *Teachers.*—How many give all their time to this work? How many are connected

with other institutions or departments? How many are permanent and how many are temporary appointments? What difficulties are experienced in filling vacancies?

XI. *Students.*—Number; grade; aim in life. Are women admitted as scholars? Are there post-graduate students?

XII. *Discipline.*—Of what character?

XIII. *Religious and moral instruction.*

XIV. *Military instruction.*—How given; with what results?

XV. *Manual labor.*—Is it required? Is it provided? Can students earn their own support? Does work interfere with study?

XVI. *Boarding-houses, lodging-halls, &c.*—What views are held in regard to their importance and their management?

XVII. *Aid for needy students.*—How provided?

XVIII. *Results of the work of the Institution.*

XIX. *Bibliography.*—What pamphlets, reports, addresses, magazine and newspaper articles have been printed in relation to the college? Copies of all legislative enactments, publications, catalogues, &c., are requested. Particular care in the preparation of statistics is specially entreated.

With this understanding, that such inquiries are soon to be prosecuted, I shall limit my report at the present time to those points on which Congress and the public may naturally seek for information immediately, without respect to the more complete and detailed reports of the future.

PRINTED SOURCES OF INFORMATION.

To begin with, I am confident that an indication of the printed sources of information on this subject will be serviceable at home and abroad.

The publications of your predecessor in this Department (Hon. Henry Barnard) have already included many statements and documents pertaining to the scientific schools of this country, to which the investigator should refer. In the report for 1867–'68 the enactments of Congress bearing date July 2, 1862, and July 23, 1866, are given in full, and that of February 24, 1867, is succinctly stated. The legislation consequent upon the congressional appropriation is also given (generally with completeness) for the States below mentioned, viz: California, Connecticut, Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, Wisconsin—in all, twenty-two States. The more recent legislation in Missouri and California will be appended to this report.

In the same report there are also descriptions, more or less detailed, of thirteen institutions, in twelve States, founded or aided by the national land grant.

Dr. Barnard has also prepared an elaborate volume on technical instruction in Europe. Dr. J. W. Hoyt, one of the American commissioners at the Paris exhibition, in his report on education has likewise paid especial attention to the subject of technical education, and collected at home and abroad many of the facts which bear upon it. In the reports of the Commissioner of Agriculture special notice has been annually taken of the agricultural colleges. Especially noteworthy are the volumes for 1863 and 1865. In the report for 1865, Hon. H. F. French, then president of the Massachusetts Agricultural College, discusses many of the most important topics bearing upon agricultural colleges, and gives detailed accounts of the agricultural schools then organized in the country.

The report for 1868 contains an important paper by Professor J. H. McChesney, of Illinois, on Agricultural Education in Germany, which is of interest not only on account of the recent facts which it presents, but for the incidental expressions of opinion and comparison.

Besides these national reports, all, or nearly all, of the institutions which are recipients of the national grant have published one or more reports of progress.

The law of Congress requires that these reports be annually sent to the Secretary of the Interior, and to each of the affiliated colleges. It is very important that this clause should be complied with, for thus publicity, one of the securities of good management, is effectually gained; but judging by the experience of one institution, I doubt whether the law is now regarded.

The principal documents of the several States which have come under my eye are named in the following list. It includes those which have been sent to the Sheffield Scientific School, to Professor W. H. Brewer, and to myself, during a long series of years. Notwithstanding the pains we have taken, we have not succeeded in making a complete series.

Many of the reports are only printed with the legislative documents, and are very difficult to procure; others are printed in small editions and quickly disappear. It is believed, however, that the publication of a preliminary list, incomplete though it is, will be of service to those who wish to form a like bibliographical collection, and

that it may rescue from oblivion some of the papers which have had an important influence upon this movement in behalf of scientific education. Additions to the list, for future publication, are earnestly solicited.*

EXTENT TO WHICH THE OFFERS OF CONGRESS HAVE BEEN ACCEPTED.

I am informed by inquiry at the Land Office, that every State in the Union has accepted and taken measures to secure the grant of land which was offered by Congress. In Arkansas and Florida the scrip has been temporarily withheld by the authorities in Washington because of some unsettled claims which the general government has upon these States. The scrip for Georgia has been prepared but not yet delivered. The States of California, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Nevada, Oregon, and Wisconsin, (ten in all,) have located their claims within their own territory; and the remaining States, Alabama, Connecticut, Delaware, Illinois, Indiana, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, West Virginia, and Wisconsin, (twenty-five in number,) have received land-scrip which has been or will be sold for the benefit of the State.

The following table exhibits the number of portions of land (amounting to 30,000 acres for every Representative and Senator in Congress) to which the several States were entitled; the whole number of acres allotted upon this principle; and an indication as to whether the State has located the land within its own borders, or has received scrip entitling the holder to locate elsewhere. The table has been officially revised in the Land Office.

TABLE II.—*Distribution of land to the several States for colleges of agriculture and the mechanic arts.*

States.	Number of senators and representatives.	Acres.	States.	Number of senators and representatives.	Acres.
Alabama*	8	240,000 scrip.	Missouri	11	330,000 land.
Arkansas	5	150,000 scrip.	Nebraska	3	90,000 land.
California	5	150,000 land.	Nevada	3	90,000 land.
Connecticut	6	180,000 scrip.	New Hampshire	5	150,000 scrip.
Delaware	3	90,000 scrip.	New Jersey	7	210,000 scrip.
Florida*	3	90,000 scrip.	New York	33	990,000 scrip.
Georgia†	9	270,000 scrip.	North Carolina	9	270,000 scrip.
Illinois	16	480,000 scrip.	Ohio	21	630,000 scrip.
Indiana	13	390,000 scrip.	Oregon	3	90,000 land.
Iowa	8	240,000 land.	Pennsylvania	26	780,000 scrip.
Kansas	3	90,000 land.	Rhode Island	4	120,000 scrip.
Kentucky	11	330,000 scrip.	South Carolina	6	180,000 scrip.
Louisiana	7	210,000 scrip.	Tennessee	10	300,000 scrip.
Maine	7	210,000 scrip.	Texas	6	180,000 scrip.
Maryland	7	210,000 scrip.	Virginia	10	300,000 scrip.
Massachusetts	12	360,000 scrip.	Vermont	5	150,000 scrip.
Michigan	8	240,000 land.	West Virginia	5	150,000 scrip.
Minnesota	4	120,000 land.	Wisconsin	8	240,000 land.
Mississippi	7	210,000 scrip.			

* Unsettled. † Prepared, but not yet delivered.

FINANCIAL RESULTS OF THE LAND GRANT.

It is desirable on many accounts that the financial management of the congressional endowments should be publicly reported, and yet it is still very difficult in many States to give an absolute statement of the result of the grant. For example, in New York, the land-scrip was mostly disposed of at a fair price to Hon. Ezra Cornell, who located it with great skill, and who is now selling portions of his allotment, from time to time, and giving to the university which bears his name the whole accrued profit. What the entire endowment is worth no one can tell.

In California, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Nevada, Oregon, and Wisconsin, all or nearly all the claims of each State are located within its own borders, and only a portion of the same is yet sold. Foreseeing the ultimate value of the land, the legislature in more than one instance has temporarily advanced a sum of money to the college or university entitled to the grant, in the certainty that in a few years this outlay will be reimbursed. One State, at least, appears to have followed the pol-

* See Table IV, at end of article.

icy of renting the lands instead of selling them, securing thus a certain income without funding the capital.

These illustrations show how difficult it is to state the capital derived from the national grant. So, also, it would be very instructive if we could ascertain to what extent the national bounty has stimulated appropriations from the local treasuries of the State, from towns and counties benefited by the new university or college, and from private individuals.

But on this subject, also, it is not easy to command the complete statistics. In general it may be stated that there is not a single instance where the national school has not received generous help from some other source than the national. grant. This outside help is first directed to securing (by gift, purchase, or construction) a suitable building by law; for no portion of the national money can be turned to bricks and mortar. In many cases excellent sites have been provided for the new institutions. In some, generous foundations for professorships are established. In all, there are contributions, more or less generons, of books and instruments. The private benefactions are, for the most part, much more liberal in the East than in the West; on the contrary, the appropriations from the public treasuries of the State, the county, or the town are much freer in the West than in the East. Three institutions bear the names of individuals whose benefactions have been so considerable as to merit this distinction.

ACTUAL ESTABLISHMENT OF COLLEGES IN THE SEVERAL STATES.

Among the thirty-four States which have received the national grant twenty-eight are known to the undersigned as having taken definite steps for the establishment of such colleges as the act of Congress contemplates. These efforts have usually been put forth in good faith; but in some portions of the country the unsettled state of public affairs has been such as to embarrass all progress. Elsewhere vague notions have prevailed respecting the possibility of securing the end in view. In some cases the national grant is so small, and the lack of public and private liberality in the State is so great, that very little has been accomplished. In many States, at the East as truly as at the West, great difficulties are experienced in securing the services of accomplished and able men as professors in the departments of science to which these institutions are devoted. This, as it appears to me, is one of the greatest obstacles which impedes the success of the movement.

In almost every State the national grant has been added to the funds of some existing institution, in order that, by the concentration of resources, greater power may be acquired; but almost invariably in such cases the congressional funds, with others expressly given for scientific purposes, have been separately invested and employed so that they may not be diverted to classical or literary studies.

Four of the New England States directed their national grant to one of the historic colleges within their borders—Yale, Brown, Dartmouth, and the University of Vermont—the conditions of connection varying in each State. Massachusetts, on the contrary, established a new agricultural college, and endowed the new Institute of Technology in Boston instead of building up Harvard, Amherst, Williams, or Tufts.

Beyond New England, New York, Ohio, Indiana, and Illinois have established new institutions. In New Jersey, Delaware, Maryland, Michigan, Wiscousin, Iowa, Minnesota, Missouri, Kentucky, California, and elsewhere the national grant has contributed to strengthen the State university, the State agricultural school, or some other pre-existent college.

The following table exhibits the location and name of the institutions to which the national grant has been directed.

TABLE III.—*A list of the States and institutions which received the national grant.*

State.	Location.	Name of institution.
Alabama		
Arkansas		Scrip not yet delivered.
California	Oakland	University of California.
Connecticut	New Haven	Sheffield Scientific School of Yale College.
Delaware	Newark	Delaware College.
Florida		Scrip not yet delivered.
Georgia		Scrip not yet delivered.
Illinois	Urbana	Illinois Industrial University.
Indiana	La Fayette	Purdue College.
Iowa	Ames, Story County	Iowa Agricultural College.
Kansas	Manhattan	Kansas State Agricultural College.
Kentucky	Lexington	Kentucky University.
Louisiana		
Maine	Orono	State College of Agriculture and the Mechanic Arts.
Maryland	Hyattsville	Maryland Agricultural College.
Massachusetts	Boston	Massachusetts Institute of Technology.
	Amherst	Massachusetts Agricultural College.
Michigan	Near Lansing	Michigan Agricultural College.
Minnesota	St. Anthony	University of Minnesota.
Mississippi	Oxford	University of Mississippi.
Missouri	Columbia	University of Missouri.
Nebraska		
Nevada		
New Hampshire	Hanover	*New Hampshire College of Agriculture and Mechanic Arts.
New Jersey	New Brunswick	†Rutgers Scientific School.
New York	Ithaca	Cornell University.
North Carolina	Chapel Hill	University of North Carolina.
Ohio		Ohio Agricultural and Mechanical College.
Oregon	Corvallis	Oregon Agricultural College.
Pennsylvania	Near Bellefonte	Agricultural College of Pennsylvania.
Rhode Island	Providence	Brown University.
South Carolina		
Tennessee	Knoxville	East Tennessee University.
Texas		
Virginia	Not yet determined	
Vermont	Burlington	University of Vermont and State Agricultural College.
West Virginia	Morgantown	West Virginia Agricultural College.
Wisconsin	Madison	University of Wisconsin.

*In connection with Dartmouth College. †In connection with Rutgers College.

WANT OF A GENERIC NAME FOR THESE INSTITUTIONS.

By the scrutiny of this table it will appear that the titles which have been affixed to these various institutions are quite different. For example, in Rhode Island and New Jersey, Brown University and Rutgers College have recognized scientific departments bearing the name of the old institutions. In Kentucky, Wisconsin, and Minnesota, colleges are established as branches of the State universities. In Wisconsin and California, the title "College of Arts" is the title of the scientific department of the State University; while in New Haven, the "Faculty of Arts" refers to the classical or literary department of the university. In New Hampshire, and several other States, the designation "College of Agriculture and the Mechanic Arts" is that which appears to be preferred.

In Pennsylvania, Iowa, and Michigan, we have the term "State agricultural college." Illinois rejoices in the foundation of an "industrial university." In Massachusetts there is an "agricultural college" and an "institute of technology." In New York the gifts and services of Mr. Cornell have affixed his name to the University of Ithaca. In Connecticut the name of Mr. Sheffield is associated with that of the "Scientific School of Yale College."

So far as the several institutions are concerned these differences in style are advantageous. Each title, if peculiar or unique, becomes a proper name, like Harvard or Yale, and is quickly associated with a characteristic reputation. But there is constant occasion to employ a generic designation. The newspapers and the public generally use the term "agricultural colleges," which is not only incorrect, but injurious, because it cherishes a notion that these foundations are only for the promotion of agricultural education.

The term "colleges of agriculture and the mechanic arts" would be much more appropriate, though not quite comprehensive enough, and it is too long a phrase to become popular. As these institutions are largely indebted to the bounty of the National Government, and are called upon to make an annual report of their progress, it seems fit that this fact should be employed to distinguish the group from other

kindred foundations which have no congressional aid. The term "National" schools of science, (or scientific schools,) has been elsewhere proposed as a generic designation.* Either "national," "governmental," or "United States," would seem to be a suitable prefix for the class of colleges and schools which are so largely indebted to the congressional endowment.

It is to be hoped that, by the action of the Department or by common consent of the authorities of the various institutions, some designation more correct than "agricultural colleges" will come into vogue.

OUTLINE OF THE ORGANIZATION OF THE SEVERAL INSTITUTIONS AIDED BY CONGRESS.

The general organization of these institutions may be seen in the following statements, which are chiefly based on the publications just referred to:

California.—After some preliminary legislation, which it is not important here to record, the State of California, by enactment dated March 23, 1868, reorganized the State University, bestowing upon it, in addition to other funds, the income of the congressional endowment now under discussion, and uniting with it, by consent of the various authorities, the College of California, which had been founded some years previous, and had already acquired an admirable site at Berkeley, in Oakland Township, Alameda County, in the immediate neighborhood of San Francisco.

Six colleges are now organized as departments of the university, viz: 1st, of agriculture; 2d, of mechanic arts; 3d, of mines; 4th, of civil engineering; 5th, of letters; 6th, of medicine.

Connecticut.—The scrip which fell to Connecticut was sold by the State and the proceeds were directed to the enlarged endowment of the scientific school of Yale College. The enactments were dated June 24, 1863, and July 6, 1864. This school was commenced in 1847, and had borne for several years the name of Mr. Joseph E. Sheffield, of New Haven, its munificent benefactor. It has now a convenient building, extensive apparatus, and a full corps of teachers. It has no farm. The number of students and the benefactions of individuals have rapidly increased since the national endowment was received. Instruction is given to graduate students, under-graduates, and special students. The sections most definitely organized are the following; (*a*) in chemistry and metallurgy; (*b*) in civil engineering; (*c*) in mechanical or dynamic engineering; (*d*) in agriculture; (*e*) in natural history; (*f*) in studies preparatory to medical studies; (*g*) in studies preparatory to mining; (*h*) in select studies preparatory to other higher pursuits, to business, &c.

Delaware.—The legislature of Delaware, by an act approved March 14, 1867, conferred the benefit of this grant upon Delaware College in Newark, an institution founded many years previous.

The catalogue announces three courses: (*a*) classical; (*b*) scientific; (*c*) agricultural.

Illinois.—By enactments made in the early part of 1867 (January 25 and February 28) the State of Illinois provided for the foundation of an Industrial University at Urbana, Champaign County. The institution was soon afterward organized and is now possessed of a farm, college buildings, apparatus, and a large body of teachers and scholars. It has received generous contributions from the town, county, and State in which it is located.

The university announces five colleges, viz: (*a*) agriculture; (*b*) mechanics and engineering; (*c*) chemistry; (*d*) natural history; (*e*) literature, science, and art.

Indiana.—On the 6th of March, 1865, the State of Indiana accepted the congressional endowment, and created a body corporate under the name of the Trustees of the Indiana Agricultural College. The institution under their charge is to be established in the neighborhood of La Fayette, and has received the name of Purdue College, in recognition of the gifts of a citizen of La Fayette.

Iowa.—As long ago as 1858, Iowa had established a "State Agricultural College and Model Farm." The congressional grant was bestowed upon this institution by enactments dated March 24 and 29, 1866. The present plan of organization was adopted November 21, 1868, and the college in its new form was opened March 17, 1869. Its site is Ames, Story County. The following courses of study are announced, all studies optional, viz: (*a*) agricultural; (*b*) horticultural; (*c*) stock-breeding; (*d*) nursery; (*e*) mechanical engineering; (*f*) civil engineering; (*g*) mining engineering; (*h*) architecture; (*i*) ladies' course; (*j*) normal course.

Kansas.—In Kansas, by the acts of February 16 and March 3, 1863, the State Agricultural College was organized. It is located in the Kansas Valley, near Manhattan, Riley County, about one hundred and fifteen miles west of Leavenworth and eighty miles west from Lawrence. The college has a farm, a building for general purposes, and a boarding-house. The college offers the following courses: (*a*) classical; (*b*) agricultural and scientific; (*c*) in military science and tactics; (*d*) in mechanic arts

* See the North American Review for October, 1867.

and civil engineering; (*e*) academic and preparatory; (*f*) commercial and mercan tile; (*g*) mineral.

Kentucky.—The trustees of the Transylvania University and of the Kentucky University having agreed to become united in one corporation, to be known as the Kentucky University, in the county of Fayette, near the city of Lexington, the State established, with the proceeds of the congressional gift, the "Agricultural and Mechanical College of Kentucky," as one department of the State University. This action was completed February 22, 1865, and the institution since that time has been in vigorous progress. It includes seven colleges: 1st, the College of Science, Literature, and the Arts; 2d, the Agricultural and Mechanical College of Kentucky; 3d, the College of the Bible; 4th, the Normal College, (not yet organized;) 5th, the Commercial College; 6th, the College of Law; 7th, the College of Medicine, (not yet organized.)

Maine.—By an act dated February 25, 1865, the legislature of Maine established a "State College of Agriculture and the Mechanic Arts," and subsequently a site was secured for the institution at Orono, in the neighborhood of Bangor. A building has been erected, a faculty appointed, and instruction is now in progress.

Maryland.—In this State, the proceeds of the land-scrip were given by the act of March 21, 1866, to the Maryland Agricultural College, which had been established in 1857, at Hyattsville, in Prince George's County, about nine miles from Washington and twenty-eight from Baltimore.

Massachusetts.—In this State, two institutions share the congressional appropriation. The Massachusetts Institute of Technology, in Boston, receives one-third the income of the fund. This institution had been already chartered in 1861; the act bestowing upon it the congressional aid was dated April 27, 1863. A costly and commodious building has been erected, admirable apparatus secured, and instruction is given by a numerous and accomplished body of teachers.

The remaining portion of the grant was bestowed upon a new institution, the Massachusetts Agricultural College, by an act dated April 29, 1863. This college is established in Amherst near to but independent of "Amherst College." It has an extensive farm, commodious buildings, varied collections, and enthusiastic teachers. Both institutions have received generous aid from the State treasury and from private benefactions. The courses in the Massachusetts Institute of Technology are these: 1st, mechanical engineering; 2d, civil and topographical engineering; 3d, chemistry; 4th, mining engineering; 5th, building and architecture; 6th, science and literature.

Michigan.—Early in 1855 an agricultural college was established in this State, on a farm at a short distance from Lansing, the capital. It has been, for most of the intervening period, in successful operation, and by its marked success has been conspicuous among all the agricultural educational enterprises of the country. By the act of March 18, 1863, the new national grant was bestowed upon this institution. It is provided with extensive grounds, good buildings, efficient teachers, and a large body of students.

Minnesota.—The agricultural college of Minnesota was established prior to 1866, but subsequently the university of the State was reorganized, and the colleges of agriculture and the mechanic arts were made essential departments of the same. It is fixed in St. Anthony, opposite Minneapolis, and has a large edifice and a farm yet undeveloped.

The organization of the university is carefully adapted to the necessities of the State. In addition to the preparatory and collegiate departments, advanced courses are arranged, 1st, in science, literature, and the arts; 2d, in agriculture and the mechanic arts. Schools of law and medicine are also proposed.

Mississippi.—Two-fifths of the land scrip allotted to this State has been recently assigned to the university of Mississippi, which, before the war, was in successful operation at Oxford. A report on the organization of the department of agriculture and mechanic arts has just been drawn up by Professor E. W. Hilgard, October 1871.

Missouri.—The legislature, by an act approved February 24, 1870, and amended March 10, 1871, established the agricultural and mechanical college at Columbia, Boone County, in connection with the State University, and as a distinct department of the same. It also established a school of mines and metallurgy in connection with the university, and this department was located at Rolla, in Phelps County. One-fourth of the national grant was directed to this branch, three-fourths to the other.

The State University had been organized in 1840 and had encountered many obstacles, especially during the war. In 1867 it was reorganized and put on a better financial basis than ever before.

New Hampshire.—The grant is given to an independent board of trustees, known as the trustees of the "New Hampshire College of Agriculture and the Mechanic Arts," and they have established their institution according to law at Hanover, in close connection with Dartmouth College. A building has been erected for this new foundation, a farm bought, and instruction commenced. Besides this foundation and the medical school, Dartmouth College has maintained for many years the "Chandler Scientific School," and is about to organize the "Thayer Foundation for higher Civil Engineering."

New Jersey.—Rutgers College, one of the two historic colleges of New Jersey, secured

the endowment in this State and directed it to the maintenance of a scientific school. A farm has been bought, a building for scientific collections is now in process of erection, and a considerable number of students have been annually taught.

New York.—The imperial grant received by the Empire State was directed (April 27, 1865) to the foundation of the Cornell University, in Ithaca, so named in honor of the munificent gifts of Mr. Ezra Cornell. Several large and costly stone buildings have been erected for the university, extensive libraries and collections have been secured, the farm is under cultivation, and a body of students, several hundred in number, are under the care of a large and able corps of instructors.

(*a.*) The general courses are those in science, philosophy, and the arts; (*b.*) the elective courses are those which the student may select out for himself; (*c.*) and the special courses are those which are pursued by a student taking up only a single department of science.

North Carolina.—The University of North Carolina, established at Chapel Hill, was seriously affected by the war, and the efforts for its reorganization have not been successful. It was announced in 1869 that it would contain eight colleges: 1st, of literature and the arts; 2d, of philosophy; 3d, of science and the arts; 4th, of agriculture and the mechanic arts; 5th, of business and commerce; 6th, the normal college; 7th of law; 8th, of medicine.

Ohio.—The fund derived from the sale of the scrip assigned to this State amounts to much more than $400,000. There has been a difference of opinion as to whether a new institution should be organized with this fund, or whether it should be directed to the strengthening of one or more of the colleges already in operation. Meanwhile the capital was increasing under the management of the State authorities. The legislature at length voted to establish an Ohio College of Agriculture and the Mechanic Arts, and to receive proposals offering a site.

Pennsylvania.—"The Agricultural College in Pennsylvania," opened in 1859, near Bellefonte, in Centre County, became the recipient of the congressional gift by an act approved April 1, 1863, and slightly modified April 11, 1866. The circular for the year 1871 offers the choice of three courses: 1st, agricultural; 2d, scientific; 3d, literary.

Rhode Island.—In this State the scrip was assigned to the corporation of Brown University for the purpose of providing and maintaining a scientific department or college. Such a department is now maintained with special reference to chemistry (in its applications to agriculture and the mechanic arts) and civil engineering.

Tennessee.—In January, 1869, the general assembly appropriated the proceeds of the sale of the land scrip to the East Tennessee University at Knoxville. The endowment was accepted by the trustees, and in June, 1869, the institution, which had been suspended on account of the war, (and resumed in 1865,) was reorganized, in accordance with the congressional law. In spite of some embarrassments, it is now making such progress as appears to the trustees satisfactory. A farm and appropriate buildings are owned by the university.

Vermont.—On the 22d of November, 1864, the Vermont scrip was assigned to a new body corporate by the name of the "Vermont Agricultural College," and on the 9th of November, 1865, this body was joined with the well-known University in Burlington, under the name of the "University of Vermont, and State Agricultural College." The reorganized institution is in successful progress.

West Virginia.—The scrip in this State is devoted to the establishment of the West Virginia Agricultural College at Morgantown. In addition to the preparatory and literary courses, there are scientific, agricultural, military, optional, and normal courses of study. The act of the State legislature bears date February 7, 1867.

Wisconsin.—By an act approved April 12, 1866, the legislature of Wisconsin reorganized the State University, established at Madison, and bestowed upon it, in addition to the income of the university fund, the income of the fund derived from the national appropriation of 1862. The university is provided with several important edifices, and a farm contiguous to the original site of the university has been bought for the promotion of agricultural science. The university has made uninterrupted progress for several years past. It includes two colleges: 1st, of arts; 2d, of letters.

The departments of agriculture, mining, metallurgy, and engineering are branches of the college of arts. The university has also a law department and a female college.

CHARACTER OF THE INSTRUCTION.

It has been shown elsewhere that in the organization and management of the national schools the influence of three distinct social wants is apparent.

First, and most easily recognized, is the need, which is felt throughout the land, of able, educated, trustworthy technologists, such as well-informed engineers, architects, mechanicians, manufacturers, miners, agriculturists, and the like. Such men the necessities of the country are loudly calling for. They find ready and lucrative employment; they contribute to the development of the national wealth. While their general culture should be as good as possible, they must be men who know how to put in practice

the principles they have learned; men who can apply to the requirements of modern society the discoveries of modern science. They must be expert, and to make them so their training must be technical, that is to say, it must have a decided bearing upon some useful calling.

Secondly. The country needs more skillful laborers; men who add to dexterity and muscular ability an appreciation of their work, an acquaintance more or less profound with the nature of the materials, the natural laws underlying the manufacturer's processes, the construction and office of the instruments and enginery employed. Such men, adding brain work to manual work, are more contented with their callings, more useful to the country, and are worth much higher wages than any other laborers. For them industrial or trade schools are requisites—the more the better.

Thirdly. There is even a greater want than the two just named. In order to carry forward scientific investigations, and to contribute to the advancement of knowledge, on which all the useful arts depend, the country requires a great many men of science. This class includes professors and teachers, investigators, and writers, leaders in the explorations of new regions, officers of trigonometrical and hydrographic surveys, geologists, naturalists—scientists, in short, who are not thinking of pecuniary returns, nor primarily of the application of science to the arts, but of the discovery of truth, and of its diffusion among men.

Now, a completely-organized educational scheme for the United States should include provision for all these three wants, by the establishment of, 1st, schools of science; 2d, schools of technology; and, 3d, schools of industry. It is not necessary to discuss which is the most useful. The eye cannot say to the hand, "I have no need of thee," nor the head to the arm. Science is helped forward continually by practical men; industry depends upon science at every stage of its progress.

To prosecute science for the sake of science is the proper work of the highest universities. Men may well devote their lives to such studies.

Technical expertness must usually be acquired at the college period of life, say between the ages of sixteen and twenty-one.

Industrial training will ordinarily be provided for youth between the ages, say, of fourteen and eighteen, or will be supplementary training to those who, having begun to work, are conscious of their own deficiencies. It is a legitimate part of the elementary school system.

It is safe to say that thus far in almost all the institutions aided by the congressional grant, the technical aspect predominates, that is to say, special efforts are put forth to train up men who shall lead in the applications of science to industry. I do not know that among all this group of colleges, there is an exception to this recognition of the obvious wants of the country. Some of the institutions also appear to have closely in mind the wants of those who are to labor with their own hands upon the farm and in the work-shop. There is one institution, and possibly more, where the presence of post-graduate students, studying science for its own sake, is regarded as of the highest value. Probably as the next decade proceeds, these three tendencies, all good and all honorable, will be more and more distinctly marked; but, at present, it would hardly be just to attempt a classification of the colleges upon this basis. We may, however, even now discover a tendency to certain special lines of work in the several institutions which are under discussion.

The congressional enactment uses the phrase "Colleges of Agriculture and the Mechanic Arts," and this terminology has governed the aim of every foundation. Massachusetts is the only State which has divided the fund—giving the larger portion for the promotion of agriculture, the lesser for technology. In Missouri, the school of mines is to be built up away from the other departments of the university, but under the same trustees. The other States propose to provide in one institution for both agriculture and the mechanic arts. But there are often decided indications of greater excellence in one department than in another. Thus, in Michigan, Iowa, Wisconsin, Pennsylvania, and hitherto, in Illinois, education in agriculture has preponderated over that in the mechanic arts. The same is doubtless true elsewhere. Such tendencies will doubtless be more and more distinctly manifested as the years roll on, and doubtless the country will be much benefited by this necessary and multiform diversity. It is very desirable that there should be as little reduplication as possible, and that each national college should have an office and aim of its own, distinct from that of other institutions, based upon a careful study of the want of the State in which it is located, the nature of the colleges and schools already organized, and the degree of culture which the young men of the region are likely to seek after and attain.

THE PROMOTION OF AGRICULTURE.

One of the most interesting inquiries which can be made in respect to the influence of the congressional grant pertains to the science of agriculture. There is no doubt that many of those who urged upon Congress the bestowal of a grant of land to the several States were deeply interested in the culture of the soil and in the development of the national resources by improving the agriculture both of the older and newer

States. There is also no doubt that, in many cases, the end to be gained was better understood than the means which should be employed, or, in other words, that the theory of agricultural education was vaguely worked out.

The action of Congress, however, was most wisely guided under the leadership of Hon. J. S. Morrill, of Vermont, then a Representative and now a Senator in Congress, so that not only agriculture, but the mechanic arts—and not only these departments of study, but all other branches of modern science—might be taught in the institutions aided by the national bounty. Even classical studies are not excluded. The object of the gift is expressly stated to be "the liberal and practical education of the industrial classes." As an indication of the mode in which the several States are trying to meet the agricultural demands, the following facts are brought together from the printed statements of the several colleges:

Delaware.—The college has the use of the farm of the professor of agriculture, embracing about 70 acres of well-improved land, adjoining the town of Newark, containing meadow, tillage, and pasture grounds, six acres in truck garden eight acres in small fruits and vineyard, five acres in apples, pears, peaches, and plums, and the whole place well supplied with stock, tools, and farm machinery.

Illinois.—The College of Agriculture consists of two divisions, styled—1st, the school of agriculture proper; 2d, the school of horticulture and fruit-growing. The college has a large stock farm of 410 acres, provided with a barn, and has a large variety of cattle. It is well supplid with farm machinery and tools.

There is also an experimental farm of about 70 acres, exclusive of orchards, &c. A cliuic for sick animals is held in the fall or winter term, to furnish opportunity for the practical study of veterinary science. Surveying and drainage are illustrated by practice in the field. The course in the school of horticulture embraces such studies as are necessary to thorough mastery of gardeuing, fruit-growing, and forestry. The school has ample horticultural grounds of about 130 acres, iucludiug 20 acres of forest plantations, 10 acres of ornamental grounds, several acres of nurseries, and large garden plats. It has an apple orchard containing about 1,400 varieties, a pear orchard of nearly 400 varieties, and various kinds of small fruits. It has two well-filled greenhouses, and is amply supplied with garden machinery and tools.

Iowa.—The farm originally purchased for the use of the Agricultural College comprises 648 acres, and contains about 160 acres of woodland. About 300 acres are under the plow, and are cultivated by the students. One hundred and ninety acres additional have recently been purchased. This tract is to supply grazing. The nursery contains about 3 acres, and the garden about 12. The farm is well supplied with barns, sheds, &c.

Kansas.—The college farm contains 80 acres, inclosed by good fences. About one-half of this tract is cultivated. Initial steps have been taken to add two or three hundred acres to the farm. Agricultural institutes are a feature peculiar to this institution, and up to January, 1870, five had been held at different places in the State.

Kentucky.—The entire tract of land purchased for an experimental and model farm comprised "Ashland," the home of Henry Clay, and the "Woodlands," a tract adjoining it. There are 463 acres in all. The Ashland estate is divided into the necessary plats of pasture and tillable lands for the handling of the various breeds of stock, and for the culture of every variety of crops. In this department students have opportunities, while defraying part of their expenses, to apply practically the principles of science which they acquire in the class-room.

The horticultural department embraces the ornamental and experimental grounds at Ashland and Woodlands, including gardens, orchards, vineyards, &c. Students laboring in this department are under the supervisiou of a skillful superintendent, and have ample facilities for practically applying the principles of botany and vegetable physiology, and for a thorough knowledge of the art of grafting, budding, and planting, and the general care and culture of all kinds of trees, shrubs, and flowers.

Maine.—The college farm contains 370 acres of good land, with buildings not yet completed, and includes extensive nurseries.

Maryland.—The instruction in agriculture is both theoretical and practical. Labor on the farm is not allowed to interfere with studies, but is superadded to the mental training, the primary object of the college. The farm contains 428 acres, with good and commodious buildiugs, and various breeds of cattle, sheep, swine, &c.

Massachusetts.—The farm at Amherst contains 383 acres, and has numerous varieties of excellent stock. The farm, besides producing various kinds of grain, is largely devoted to the growing of the sugar-beet. The students are all required to work more or less of the time, and, under the skillful and enthusiastic guidance of their instructors, are heartily interested in their work. The success of the agricultural college crew in the regatta of 1871 was a very significant occurrence, which may well be noticed by all who are interested in questions of physical culture.

Michigan.—The farm contains 676 acres, about 300 of which are under cultivation. Botanical, vegetable, and small fruit gardens, orchards, nurseries, museum of vegetable products, and varieties of stock, are used constantly as means of illustrating the

theoretical science as given in text-books. The success of this institution has been assured for many years past.

Minnesota.—The course of instruction extends through ten years, conditions of admission requiring that the applicant be at least sixteen years of age, and possessed of a good English education. Practical applications of the various subjects of geology, mineralogy, entomology, &c., are given in the study of soils, the examination of insects and their effects upon vegetation, &c.

Missouri.—In 1870 the county of Boone and town of Columbia, Missouri, gave, as a bonus for the location of the college at Columbia, the sum of $30,000 in cash, and 640 acres of land as the agricultural college farm. On the farm are several houses, one of them an elegant mansion, worth $15,000 or $20,000. There are also on the ground two large vineyards.

New Hampshire.—The total area of the farm is 158 acres. Of this, about 25 acres are purchased by the college, and the remainder, in a separate tract, was bought by Professor Dimond and is held by him to be transferred to the Agricultural College whenever it shall have means to make the purchase. It has a desirable variety of soil and embraces a considerable number of acres of woodland.

New Jersey.—The farm contains 99 acres in all. As only about one-third of it is upland, much draining has been necessary, involving a great deal of labor and expense. The crops are the ordinary staples, varied slightly on account of the nearness to the city and the markets. The farm is stocked with horses, mules, cattle, and hogs—no sheep. The horses and mules are ordinary team animals.

New York.—Cornell University has a farm of over 200 acres, with the necessary outbuildings and implements. In the instruction given, laboratory and field practice are combined with the usual lecture-room work, to the utmost extent possible. Three courses of study have been arranged, one of which requires four years for its completion and leads to the degree of bachelor of science. The other two are abridged courses, one of three, and the other of two years, comprising nearly all the purely agricultural instruction given in the full course. These abridged courses were made out to meet a want that appeared at the opening of the university, and it is believed that a large portion of the agricultural community, which would otherwise derive little advantage from the establishment of the college, will be benefited by them.

Pennsylvania.—The farm at the Agricultural College, near Bellefonte, embracing 400 acres of land of excellent natural quality, is still quite rough and stony in many parts; but, it is thought, a few more years of labor will bring it all into good working order by the efforts of the students themselves. The entire college building is 234 feet in front, embracing a central part and two wings, all facing in the same line, and two curtains between the center and the wings and facing on a parallel line with the others, but 10 feet farther back.

There is a nursery covering about six acres; five acres more are devoted to producing summer pears, mulberries, quinces, plums, &c.; and two more are appropriated for a vineyard. Hedges are cultivated to a great extent. Corn and wheat constitute the main crops.

The State maintains two other experimental farms, one in the neighborhood of Philadelphia, and the other near Pittsburg, so that the eastern, central, and western districts may have benefit of experiments adapted to local differences of climate, soil, &c.

Tennessee.—We quote from the catalogue of the State Industrial College for 1870–71: "A beautiful farm, admirably suited to be made a model, is provided, where these subjects may be taught practically. In addition to the professor of agriculture, a very competent agricultural chemist, who has spent the past two years in Europe, studying the sciences and visiting various colleges and schools, will return by the opening of the next session with a supply of the most improved apparatus for the laboratory." "It is frankly stated that this department is just inaugurated, and its work is not fairly begun, but its success is certain if it only has the friendly co-operation of the farmers themselves."

Vermont.—The only form in which the Vermont Agricultural College offers training in agriculture is that of theory, except so far as practice in the chemical laboratory can be applied to agricultural subjects.

A special course of lectures on agricultural subjects is given in February and March, to meet the wants of young men who cannot leave their homes in the summer or autumn.

Wisconsin.—The farm has an area of over 235 acres, and is intended especially "as *an experimental farm* where agriculture is to be practically taught by experimenting on different soils and location of the land, and *not a model farm*, where the best kind and largest quantity of particular products are sought to be obtained from a particular piece of land."

As yet, everything connected with this department is too new to show extensive or very conclusive results in any series of experiments, but constant improvements are being made in the farm itself, and the methods of experimenting on it.

MANUAL LABOR.

There is a great difference of opinion and usage in respect to the desirability of requiring manual labor from young men who are attendant upon the national schools of science. At New Haven it has not been thought practicable to exact any such duty from young men whose time was fully occupied with their scholastic work; but in many other places the opposite opinion has prevailed. With the exception of a small number of colleges, I should think the tendency was away from rather than toward an increase of manual labor. When it is prescribed, the opinions differ as to the end which should be kept in view—some thinking chiefly of the health which physical exercise promotes, others of the economy which labor secures, and others still of the dexterity and skill which proceed from the constant use of implements.

As illustrations of the state of the question, the following statements are condensed from recent reports:

Delaware.—All students in the agricultural department who are not excused on account of physical inability are required to labor on the farm, under the direction of the professor of agriculture, from *one* to *two* hours each day, except Saturday and Sunday. This labor is designed to be educational; to exhibit the practical application of the theories taught in the text-books and lecture-room; to preserve habits of industry when they have been formed, and to form them where they do not exist; to give facility and precision in the use of implements, and skill in the application of labor, and to secure more valuable physical culture than can be furnished by any system of gymnastics. In addition to the time thus devoted to *educational labor*, all students have the opportunity of working on Saturday, and such other times as will not interfere with a thorough preparation for the recitation-room, when there is any work to be performed; for such work they receive from 8 to 12 cents per hour, depending upon the ability and fidelity of the laborer.

Iowa.—The law requires that manual labor, an average of two hours and a half per day, should be as regular on the part of the student as the daily recitation. The following are the rates of payment for the year 1871, as established by the trustees:

1. Students working on the farm or doing other heavy work which is not instructive shall be paid at the rate of from 3 to 9 cents per hour.

2. Students laboring in the garden, orchard, or ornamental grounds, shall be paid from 3 to 7 cents per hour.

3. Students laboring in the work-shop shall be furnished with tools and all needed instruction, but shall receive no compensation until their labor is of value to the college, when they shall be paid the same rates as those laboring on the farm, deducting a moderate sum for the use of the tools.

4. Young ladies laboring in the dining-room, kitchen, laundry, or bakery, shall be paid the rates received by young men laboring on the farm.

The president in his report says: "All labor of the garden, orchard, nursery, vineyards, ornamental grounds, and nearly all the labor of the farm, has been done by the young men; and the young women have, with an equal zeal and energy, done almost the entire work of the dining-room, kitchen, and bakery. Still, the workers are so numerous, and the labor so various, that it is very difficult to manage this department so as to make it remunerative to the college."

Maine.—Students are required to labor not more than three hours of each day for the five days in the week, the nature of the work engaged in at any time being such as to correspond with the science studied at the same time, as far as possible.

Massachusetts.—Under direction of Professor Stockbridge, the students have done a great amount of labor during the past year, much of it of the least interesting and most disagreeable kind, such as ditching, stump-pulling, and digging up old orchards. All students of the regular classes, unless physically incapacitated, are obliged to work upon the farm without compensation six hours each week, whenever called upon to do so. The intention of the system of compulsory manual labor is altogether educational.

Kentucky.—All students of the agricultural and mechanical college are required to spend a portion of their time in active labor, either in the agricultural, horticultural, or mechanical department. They are distributed into these several departments according to their respective qualifications, and as far as practicable in harmony with their wishes and purposes in life. Students who wish to defray a portion of their expenses while acquiring their education are required to labor four hours a day, six days in the week. The rates of compensation vary from 5 to 10 cents per hour during the first year, and from 10 to 20 cents per hour during the second and third years, according to industry and proficiency. All other students are required to work two hours per day, three days in the week, in the horticultural department, without compensation. All students applying for admission are free to select either the compensated or uncompensated labor.

MILITARY SCIENCE.

It appears that the clause of the congressional bill requiring the national colleges to teach military science and tactics has given, in most of the States, a great deal of trouble. Occasionally the requirement is regarded with favor by the faculty, but so far as my observation has gone, in most of the States the repeal of the clause would be welcomed. Without special help from the State or from Congress, the thorough training of a military school cannot be secured, and it is questionable whether the little that is done for the recognition of military science in most of the national schools is of any real advantage. It would seem to me very desirable to leave the college in each State free to determine whether or not to maintain military tactics as a branch of instruction. Among the announcements on this subject, I select and condense the following:

Massachusetts.—The agricultural college has provided amply for instruction in military science. A convenient armory and a spacious hall have been erected, the State has furnished arms and equipments, and the United States supports at the college an officer who has entire charge of this department. The military drill in the hall is, to a great extent, substituted for manual labor in the field during stormy weather and the winter season.

Delaware.—According to act of Congress, all students connected with the college must be connected with the classes in military tactics and engineering, but the faculty may, for sufficient reasons, exempt any student from the drill.

California.—Measures have been taken to carry out the provisions of the act creating the university, in respect to military instruction and discipline. Professor Welcker and Assistant Professor Soulé, graduates of the West Point Academy, have organized the battalion of the university cadets. All able-bodied male students of the university are required to attend the military exercises.

Illinois.—All students, unless excused for sufficient cause, are required to take part in military exercise. There is taught a class in military science and art, as far as it is necessary for duties as officers of the line. Students may be admitted into this class after having participated at least two terms in the general military exercises. The instruction, theoretical and practical, does not occupy more than five hours each week.

Kansas.—The practical portion of the military instruction is obligatory upon each student, and embraces the manual of arms, including the loadings and firings, target-practice, and a knowledge of the school of the soldier and the skirmish drill.

The theoretical portion of the course is elective, and embraces the general history of the art of war, and the elements both as an art and science. The course of study extends over a period of two years. A drill in some one of the arms of service, at least twice a week, is required.

Kentucky.—In accordance with the congressional act, regular instruction is given to the students of the Agricultural College in the infantry drill and military discipline and police, in accordance with the regulations prescribed for the United States Army.

Iowa.—All male students of the college, except such as may be excused, are expected to attend all military exercises in their respective classes. The company organization conforms strictly with the United States Regulations, and the company officers and non-commissioned officers are severally instructed in the duties which devolve upon their respective ranks.

CONCLUSION.

In closing these statements respecting the national schools of science, it seems important to add, that many of the colleges of the country which do not receive the national grant are introducing scientific departments and courses of study; so that we shall doubtless soon have as manifold reduplications of the scientific schools as we already have of classical colleges. Many, if not most, of these enterprises will for years be weak, partly for want of funds, partly for want of teachers, partly for want of definiteness of aim, and partly from undertaking to accomplish too much. This state of things, though undesirable, is in a great degree inevitable. The wide diffusion of enterprise, the popular regard for education, the youthful enthusiasm and resolution of every part of the country, the American readiness to seize and carry forward new ideas regardless of experience and precedent, all contribute to this new development of educational plans. In the end we must expect to see failure as well as success; strong prejudice awakened against the schools of science, and equally strong confidence in their enduring importance; but the net result is sure to be of the greatest service to the country and mankind.

Fortunately for the culture of the nation, the love of scientific research has grown up, and the need of technical instruction has been advocated from no spirit of hostility toward literary and classical training. The traditional colleges of the country are stronger to-day than they have ever been before. Their courses of study and methods of discipline have been criticised by their advocates far more than by their opponents. Modern science has only asked for a free course—willing and eager that every branch of human knowledge useful to mankind should have the same liberty.

More than this can be said: the wisest and best-informed advocates of the scientific school insist upon lingnistic training forming part of the curriculum for youth. In some cases Latin is expressly required; commonly French and German are indispensable; and there are gratifying indications that the critical study of the mother tongue is to be promoted with the same thoroughness heretofore exhibited in the study of Latin and Greek.

DISCIPLINE DEFINED.

It would be well if all who are interested in the relations of science and of language to education would ponder a well-considered and elaborate essay in the North American Review for October, 1871, which was written by a scholar who is acknowledged in Germany, as well as at home, to stand among the foremost of philologists, Professor W. D. Whitney.

In reference to the perpetual echo of the word "discipline" in educational discussions, he makes the following pithy remarks: "Discipline is a word with which not a little conjuring is done now-a-days by men who fail to understand fully what it means. It is often spoken or written of as if it were itself an end, or at least the means to an end; as if it were something quite unconnected with the acquisition of valuable knowledge; as if the acquisition of certain kinds of knowledge always gave discipline, while that of other kinds did not; and so on. Now, properly speaking, culture and training are the only ends, and the acquisition of knowledge the only means to them, while the position of discipline is rather that of a method. The essence of discipline is simply preparation; that is a disciplinary study which duly leads the way to something that is to come after. He who sets up discipline and knowledge as opposed to and excluding each other, wholly misapprehends their mutual relations, and casts the advantage into the hands of his adversaries. In reality, the connection and interdependence of the two are complete. No discipline without valuable knowledge acquired; all valuable knowledge available for discipline; the discipline in proportion to the amount and value of the knowledge acquired—these are fundamental truths in the theory of education.

"Only, of course, the degree of value of any given knowledge is not absolute, but relative. One kind of knowledge is worth more to men in general, another to a particular learner, in view of his natural disposition, his past studies, or his plans for the future; one kind is worth more than another at a certain stage of education; one kind should be taught in a certain manner and extent, another in another. The disciplinary method implies that the instructor, viewing the whole body of knowledge in its connections and applications, will bring before his pupils' mind the right kind, at the right time, to secure the best result in the end."

He also adds the following remarks upon the relations of science to language in an educational scheme. If such just and enlightened views were generally prevalent, it would be of the highest advantage to the progress of truth and civilization:

"Nothing, therefore, can well be more unfortunate for the cause of education than that misunderstanding should prevail between the representatives of two departments of study so nearly agreeing in both object and method, which are not antagonistic, and hardly even antithetical, but rather supplementary to one another; nothing sadder than to hear, on the one hand, the works of man decried as a subject of study compared with the works of God, as if the former were not also the works of God, or as if the latter concerned us, or were comprehensible by us, except in their relation to us; or, on the other hand, to hear utility depreciated and facts sneered at, as if utility were not merely another name for value, or as if there were anything to oppose to facts save fictions. Men may dispute as to which is the foremost, but it is certain that these are the two feet of knowledge, and that to hamper either is to check the progress of culture. Each has its undesirable tendencies, which the influence of the other must help to correct; the one makes for overconservatism, the other for overradicalism; the one is apt to inspire a too credulous trust to authority, the other an overweening self-confidence, a depreciation of even rightful authority, a contempt for the past and its lessons. Both alike have an imperative claim to our attention, and upon their due combination must rest the system of education, if it would be indeed disciplinary.

"Into the more practical question of what constitutes their due combination we do not here enter, having undertaken to speak only of some of the principles that underlie its settlement. What part of philological training shall be given through the English, the other modern tongues, or the ancient; how we are to avoid cram, and give that which, instead of obstructing or nanseating, creates the capacity and the desire for more; how to adjust the details of a proper compromise between the general and the special discipline and culture; these and matters demanding the most careful consideration, and sure to lead to infinite discussion, since upon them the differences of individual taste, capacity, and circumstance must occasion wide diversities of opinion.

"In conclusion, we will only repeat that those differences themselves have to be fully allowed for in our systems; that we may not cut out too strait-laced a scheme of study; to be forced upon all minds that in an acknowledged course of compromise

and selection it were foolish to exact uniformity; that we should beware how much we pronounce indispensable, and how we allow ourselves to look down upon any one unversed in what our experience has taught us to regard as valuable, since he may have gained from something else that we are ignorant of an equal or greater amount of discipline and enlightenment. Let us, above all things, have that wisdom which consists in knowing how little we know; and, as its natural consequence, the humility and charity which shall lead us to estimate at its utmost value and to respect what is known by our fellow."

I am, dear sir, yours, respectfully,

D. C. GILMAN.

General J. EATON, Jr.,
United States Commissioner of Education, Washington, D. C.

TABLE IV.—*Preliminary list of local publications pertaining to the national grant.*

CALIFORNIA.

1862.—Incorporation, organic basis and laws of the College of California. 16 pp., 8vo.
1863.—Memorial of the trustees of the College of California, asking for the national grant.
1864.—Report by Professor J. D. Whitney and others, on establishing a State university.
1866.—Report upon a projected improvement of the estate of the College of California, by Olmsted Vaux & Co. 26 pp., 8vo., with a plat of the grounds.
1868.—Prospectus of the University, (including the legislation of the State, by-laws of the regents, &c.) pp. 43, xi, 8°.
1869.—Prospectus, (including catalogue, schedule of studies, &c.,) statutes of the University of California. 10 pp., 8vo.
1870.—Register of the University of California, 1870–'71. 67 pp., 8vo.

CONNECTICUT.

1846 and every subsequent year. Catalogues of Yale College.
Memoir of Professor J. P. Norton. New Englander, vol. x, 1852.
Memorial of Professor J. P. Norton. 12mo.
Report of the joint standing committee on education in the general assembly of Connecticut, (May session, 1847,) on the establishment in Yale College of a professorship of agriculture and the arts. (Signed by Ephraim Williams, chairman.)
1856.—Scientific schools in Europe, by D. C. Gilman. 11 pp., 8vo. (Printed also in Barnard's American Journal of Education.)
Scientific education the want of Connecticut, by D. C. Gilman. 8 pp., 8vo. (Printed also in the Connecticut Agricultural Society's Transactions.)
Appeal in behalf of the Yale Scientific School. 32 pp., 8vo.
Private proposal for reorganizing the Scientific School of Yale College. (Foolscap sheet.)
Proposed plan for a school of science in Yale College. 32 pp., 8vo.
Plan of an agricultural school, by Professor J. A. Porter. 8 pp., 8vo.
Plan of an engineering school, by Professor W. A. Norton. 4 pp., 8vo.
Science and scientific schools. An address before the alumni of Yale College at commencement in 1856, by Professor J. D. Dana.
1860.—Agricultural lectures at Yale College. Reported by H. S. Olcott. 12mo.
Regulations of the Scientific School of Yale College, (several editions in successive years.) 4 pp., 8vo.
1863.—Statement respecting the Sheffield Scientific School, laid before members of the legislature of Connecticut. 4 pp., 8vo.
1864.—Prospectus of the Sheffield Scientific School. 4 pp., 8vo.
1865.—Circular of the Sheffield Scientific School. 4 pp., 8vo.
Circular respecting a course in agriculture. 4 pp., 4to.
1866.—First annual report of the State visitors of the Sheffield Scientific School. 40 pp., 8vo. (Containing a history of the foundation.)
1867.—Second annual report of the Sheffield Scientific School, containing a description of Sheffield Hall, (with cuts.) 64 pp., 8vo.
Acts of Congress and of the Connecticut legislature, respecting the national grant. 4 pp., 8vo.
On the relations of scientific education to industrial pursuits, by Professor C. S. Lyman. An address at the twenty-first anniversary of the Sheffield Scientific School. 8vo.
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